

# The Use of Blended Diets in Children With Enteral Feeding Tubes: A Joint Position Paper of the ESPGHAN Committees of Allied Health Professionals and Nutrition

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## ABSTRACT

**Objectives:** This joint position paper of the Committees of Allied Health Professionals (CAHP) and Nutrition (CON) of the European Society for Paediatric Gastroenterology, Hepatology and Nutrition (ESPGHAN) provides a comprehensive guide for health professionals to manage blended diets in children via gastrostomy tubes.

**Methods:** A systematic literature search was performed from 1992 to 2021 using Pubmed, MEDLINE, and Cochrane Database of Systematic Reviews and recent guidelines reviewed. In the absence of evidence, recommendations reflect the authors' expert opinion. Final consensus was obtained by multiple e-mail exchange and virtual meetings of the CAHP and CON.

**Results:** Reported benefits of blended diets include reduced GERD and infections, improved defecation, level of alertness and attention span, skin conditions, and appearance of hair and nails. Families report a sense of greater normality. Small case series, cross-sectional surveys, questionnaire-based small case studies, reports of personal experience, and single-center pilot studies are available in the medical literature. A total of 20 recommendations for practice were made based on the results and consensus process.

**Conclusions:** There is little evidence published to formally inform about the potential health benefits or risks of this practice and how to use it in the best way. This leaves health professionals caring for such patients in a relative vacuum regarding what to consider when providing a duty of care to patients and carers who wish to pursue this method of feeding. This article provides guidelines for safe and appropriate use of a BD, but more research is needed.

**Key Words:** blended diet, gastrostomy, pureed table food

(*JPGN* 2023;76: 109–117)

Enteral nutrition support (ENS) is given to patients whose oral intake is inadequate or to those who cannot eat normal food and refers to the application of specialized liquid formula feeds given via a feeding tube and specialized oral nutrition support<sup>(1–3)</sup>. A blended diet (BD) is one that uses real food rather than just formula<sup>(4–6)</sup>.

Feeding difficulties in children with neurodevelopmental disorders are common and have been found in up to 85% of children with spastic quadriplegia, with a positive correlation between the degree of motor deficit and the need for gastrostomy support<sup>(7–9)</sup>. The incidence of cerebral palsy (CP) is around 2.5 per 1000 live-born children in Europe<sup>(9)</sup>.

Received January 25, 2022; accepted August 20, 2022.

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## What Is Known

- Blended diet (BD) is a term used to describe the process of giving liquidized or blended food into the enteral feeding device of patients requiring tube feeding and is different from an orally offered pureed diet. BD can be used to provide all or part of the nutrition.
- Parents using this method of feeding for their child have reported benefits including reduced gastrointestinal symptoms, improved level of alertness, and overall wellbeing.
- Publications are mostly small case series, questionnaire-based studies, cross-sectional surveys, and single-center pilot studies. Laboratory-based studies are sparse and focus only on aspects of the BD. This leaves families and health professionals advocating the use of BDs relatively unsupported.

## What Is New

- BD is increasingly used by parents to feed their tube-dependent children.
- Blended food can be used safely if a thorough risk assessment is carried out first to make sure the child is suitable for a BD and the family capable of providing a BD at home, as well as agreeing on an emergency plan to address a blocked tube.
- A dietitian should offer advice and monitoring to guarantee an adequate nutrient intake and growth when used either as an exclusive or a partial diet.
- BD may have psychosocial benefits to children depending on tube feeds and their parents.

A large number of these children are therefore expected to have feeding difficulties, and a significant proportion of them may require gastrostomy ENS. A prevalence study in the Netherlands has shown that 83 to 92:100,000 children received home enteral nutrition between 2010 and 2014<sup>(10)</sup>. Data collected from 6

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European countries over a 2-year period starting in 1999 revealed differences in the use of gastrostomy tube feeding in children with CP<sup>(11)</sup>. The reasons behind this may reflect different access to health care systems, clinical practice, or both.

Standard complete feeds available for tube feeding are ready to use liquid formulas or powdered preparations, which are made up with water prior to feeding. Both are aimed at providing a balanced mixture of age-appropriate essential macro- and micronutrients required for growth. These commercially prepared formulas have been available since the second half of the last century and are considered the gold standard for the use as a sole source of nutrition<sup>(12,13)</sup>. However, children with CP are often below the weight centile expected for their length as the volume of these feeds required for adequate nutrition is poorly tolerated<sup>(14)</sup>.

Before standard formulas came into medical practice giving pureed foods into a feeding device was the standard of care<sup>(15)</sup>. According to research, enteral feeding was first used in ancient Greece and Egypt, and the concept of BD is hence not new<sup>(4,15)</sup>.

There has been a growing demand for the use of blended food via gastrostomy feeding tubes as an alternative to prescribed liquid feeds in children dependant on ENS<sup>(16)</sup>.

While there is evolving evidence to suggest health benefits of BD use in patients with neurological impairment who have been long-term tube-dependent, large numbers of medical professionals have been reluctant to advertise its use, as some expressed concern that BDs could be unsafe and hence inferior to commercially prepared enteral formulas<sup>(17,18)</sup>.

This has left many families unsupported increasing the risk of giving nutritionally inadequate diets to their child as many use BD regardless and rendered dietitians agreeing to give advice potentially unprotected. The ESPGHAN CAHP and CON believe that this topic therefore requires urgent attention.

This joint position article aims to review the current evidence, assess potential difficulties and risks to provide guidance for health care providers how to manage BD in children depending on tube feeds. Relevant literature is reviewed, recommendations made, and scope for future research outlined.

## METHODOLOGY

An ESPGHAN working group consisting of members from the AHP and Nutrition Committees and invited experts in the field, including pediatric gastroenterologists, dietitians, and speech and language therapists, was formed in 2020 to formulate a current evidence clinical practice guideline for the use of BD in children. A systematic literature search was performed using Pubmed, MEDLINE, and Cochrane Database of Systematic Reviews from 1992 to 2021 using the search terms “blended diet, blenderized diet, blended food, liquidized diet, pureed table food, gastrostomy, tube, feeding.” A total of 39 articles were considered relevant and included.

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A summary of the relevant literature reviewed can be found in the Online Supplementary Material, Supplemental Digital Content, <http://links.lww.com/MPG/C925>. In addition, recent guidelines were reviewed. In the absence of evidence, recommendations reflect expert opinion of the authors. Final consensus was obtained by multiple e-mail exchange and virtual meeting platforms of the CAHP and CON. The quality of evidence for each practice point was based on grading of the literature using the GRADE system<sup>(19)</sup>, and the strength of recommendations made was divided into strong or weak.

According to the GRADE system, the quality of evidence was graded as below:

1. High: Further research is unlikely to change confidence in the estimated effect.
2. Moderate: Further research is likely to impact on confidence in the estimated effect and may lead to change.
3. Low: Further research is likely to impact on confidence in the estimated effect and is likely leading to change.
4. Very Low: Any estimated effect is uncertain.

The strength of recommendations was defined as below:

Strong: When the desirable benefits of an intervention clearly outweigh the undesirable effects, or when the desirable benefits of an intervention clearly do not outweigh the undesirable effects. The joint CAHP/CON expert group can, however, make strong recommendations based on less strong evidence when high-quality evidence is not possible to obtain, and the anticipated benefits strongly outweigh harm.

Weak: When it is not clear if the desirable benefits of an intervention clearly or not clearly outweigh the undesirable effects due to low quality of evidence or because the available evidence suggests that the desirable and undesirable effects are similar.

The members of the BD working group voted on each recommendation and consensus was reached for all.

## RESULTS

### BD Terminology

Blended foods, liquidized tube feeds, blenderized food/diet, liquidized diet, homemade blended formula, and pureed table food are all terms which have been used to describe the process of giving solid food blended and mixed with water or any other liquid including expressed breast milk, cow's milk -or plant-based formula through the feeding device of a patient requiring tube feeding in addition to, or as a complete replacement of commercially available liquid formulations<sup>(20)</sup>. Some families, particularly of younger children, use commercially available jars of infant weaning foods, while others rely completely on blended whole table foods<sup>(4,5,6)</sup>. In some European countries, the term BD is also used for oral pureed

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The authors report no conflicts of interest. This is a joint position paper of the ESPGHAN Committees of Allied Health Professionals and Nutrition.

Supplemental digital content is available for this article. Direct URL citations appear in the printed text, and links to the digital files are provided in the HTML text of this article on the journal's Web site ([www.jpagn.org](http://www.jpagn.org)).

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DOI: 10.1097/MPG.0000000000003601

food. However, in this article, the term BD refers exclusively to tube BD.

Commercial feeds with food-derived ingredients are now also available <sup>(21)</sup>.

## BENEFITS OF A BD

### Psychosocial Benefits

BD can help to normalize the tube experience for the parents as giving food and including children in family meals forms an important part of routine parenting <sup>(22)</sup>. Having more choice in what nutrition their child receives gives parents a positive sense of normality and de-medicalization of feeding <sup>(23)</sup>. Benefits to the emotional wellbeing of the child and psychosocial interactions of the whole family have been observed <sup>(23)</sup>.

A family meal, where all members including the tube fed child share the same food, has psychosocial benefits and gives parents a sense of being in control <sup>(24)</sup>. In addition, it can have a beneficial impact on the eating habits of the whole family as there is a greater focus on eating the right food <sup>(24)</sup>.

### Improvement of Gastrointestinal Symptoms

A significant number of children with neurodevelopmental disorders have oromotor and swallowing difficulties and signs of foregut dysmotility such as gastroesophageal reflux disease (GERD), gastric dysrhythmia, and delayed gastric emptying associated with vomiting and poor gastric feed tolerance <sup>(25)</sup>. In addition, constipation caused by low-fiber enteral feeds, poor abdominal muscle tone, and reduced mobility levels in wheelchair-dependent children have a negative impact on the ability to tolerate feeds <sup>(26)</sup>.

Improvement of troublesome upper gastrointestinal (GI) symptoms including retching and GERD have been reported <sup>(27)</sup>. In addition, vomiting was also reduced, and several cohort studies have shown a significant improvement in foregut dysmotility when children were transitioned to a BD <sup>(24,27,28)</sup>. Some children were able to tolerate larger feed volumes when blended foods were introduced compared to commercially available standard formulas <sup>(23)</sup>. A proportion also showed more interest in eating orally and some report the ability to “taste” food <sup>(29)</sup>. It is not understood how the use of BD leads to an improvement of upper GI symptoms. Blended food has a higher viscosity compared to a standard enteral formula and may hence contribute to the reduction in GERD <sup>(27)</sup>. Taste receptors and endocrine cells located in the gastric mucosa may be activated by different food components of the blends and have a positive effect on secretory and motor functions of the stomach <sup>(29)</sup>. Lower GI symptoms commonly encountered on standard tube formulas include both diarrhea and constipation <sup>(27,30)</sup>. Parents have noticed an improvement of either symptom after the introduction of a BD <sup>(23)</sup>. The increase in digested fiber and bacterial diversity in the gut may be the reason for the change in bowel habits <sup>(28)</sup>.

### Reduction in Hospital Admissions and Improved General Wellbeing

Better weight gain, sleep, increased level of alertness and attention, and an improvement of skin, nails, hair, and health in general as well as reduction of irritability and abdominal pain have all been reported and can be life changing <sup>(23,27,28,31–33)</sup>.

A prospective study on 70 children who either received a BD or conventional formula showed that those on BD required less reviews in the emergency department and hospital admissions, had improved quality of life and less GI symptom scores on validated questionnaires <sup>(34)</sup>. In addition, BD also had a beneficial impact on lung health and was associated with a reduction in infective complications <sup>(23)</sup>.

## Positive Influence on the Microbiome

There is growing evidence to suggest an association between BD and increased intestinal bacterial diversity and hence a positive effect on the gut microbiome <sup>(27,35)</sup>. The association between the composition of the gut microbiota and human health and disease has been of intense interest in recent years <sup>(34–37)</sup>.

The blenderized enteral nutrition diet (BLEND) study has shown an increased provision of protein, fiber, and sodium with the use of BDs compared with commercially available enteral feeds, as well as improved intestinal bacterial richness and diversity of species <sup>(27)</sup>. A varied BD may help in improving and maintaining a healthy gut and hence explain the beneficial effect on overall wellbeing as well as improved appetite and oral intake in a proportion of children <sup>(38)</sup>. These benefits can contribute to a reduction of health care costs <sup>(16)</sup>. In addition to improved weight gain BDs may also have a positive impact on the micronutrient status, as blending food with a high range blender can be superior in reduction of food particle size and break down of the cells walls of certain vegetables compared to chewing food in the mouth <sup>(39)</sup>.

## RISKS OF BD

### Blocked or Damaged Feeding Tube

While there is growing evidence for the beneficial effects of a BD, it is not without potential risks. One major concern is blockage or damage to the feeding tube <sup>(11)</sup>.

While a balloon gastrostomy button can easily be replaced at home, others held in place with a gastric bumper are more difficult to change, as a general anesthetic and endoscopy or interventional radiology theater slot are usually needed <sup>(40,41)</sup>.

### Food Hygiene

Unlike commercial formula feeds, blended food is not sterile and could therefore cause infections or food poisoning, particularly if food hygiene and safe storage of blends is not practiced <sup>(20,42,43)</sup>.

However, there is paucity of evidence in the literature to truly justify this concern <sup>(44)</sup>. Although practiced by some families, hanging feeds and giving via a feeding pump may not be advisable due to the prolonged time the blend is kept at room temperature <sup>(28)</sup>.

### Nutrient Supply

To allow for application into a feeding tube, blended foods need to be made up with enough liquid. The resulting volume is often quite large compared to formula feed and may be less tolerated and insufficient to provide adequate nutrients <sup>(45)</sup>.

Thinner larger blends are less well tolerated by some children <sup>(46)</sup>. Making blends with a thicker consistency may therefore work better for these patients.

In addition, the nutritional content of home prepared blended foods varies and the exact amount of calories and micronutrient applied is unknown <sup>(47,48)</sup>. As making blends suitable to pass through a feeding tube may require diluting the feeds, patients are hence at the risk of receiving an inadequate calorie intake <sup>(1,49)</sup>. As the amount given is not dictated by the child's appetite but the carer giving the BD, children may be at the risk of becoming malnourished and should be supervised by a dietitian <sup>(50,51)</sup>. Furthermore, preparation and storage can also impact on the nutrient content of blends, for example, the levels of some vitamins of fruit and vegetable can vary if they are stored fresh compared to frozen <sup>(52)</sup>. The micronutrient content in blended foods is difficult to measure and could result in deficiencies <sup>(29,34)</sup>. Mixing blended foods with a prescribed formula or a

readily available blended feed or supplement with a stable nutrient content may help to overcome this problem<sup>(53)</sup>. However, healthy children also have a variation in their nutritional intake. In reality, the risk is therefore likely to be small. Reassuringly, the results of the BLEND study showed that participants receiving BD had a similar, if not greater, intake of micronutrients compared to those who were given a commercial formula<sup>(27)</sup>.

A case series on children from Singapore had similar results as all their patients on BD met the recommended nutrient intakes<sup>(54)</sup>.

Furthermore, the risk of offering an inappropriate BD to their child reduced greatly over time, as parents become more experienced in preparing and offering blends<sup>(24)</sup>.

## Medication

The absorption of medication may change during the transition from a standard enteral feed to BD as gastric emptying of blended solid foods differs. The variable macronutrients of different blends like those with more protein may further influence this<sup>(55)</sup>.

Toxic drug levels or under prescribing of essential medication, for example, to prevent seizures, could hence occur and a physician overseeing the child's care should be consulted prior to the start of a BD<sup>(56)</sup>. Monitoring of drug levels, at least at the beginning of the introduction of blended foods, may also be needed. However, the diet of orally fed children depending on medication also varies from day to day and this concern may hence be unfounded.

## Financial Implications

Connector pieces of syringes and feeding lines may need to be changed more often to give blended foods into an enteral feeding device making application of blended foods not only technically more challenging but potentially more expensive, if devices require more frequent change<sup>(57,58)</sup>. Some countries offer community nursing support to patients on gastrostomy feeds and may be part of a care package arranged via the company providing the commercial feeds. Such support could cease to exist if commercially available formula feeds are replaced with BD resulting in an increase of the burden of care to the family as nurses may no longer come to the home of the child. Although the use of blended family foods would reduce financial spending of the health care provider, the parents will have increased food bills and may not be able to purchase an expensive blender. Low-income families may struggle to afford the extra costs<sup>(59)</sup>. However, families would have to include their child's food into the monthly budget if their child did not have the need for tube feeding and one could hence argue that the extra expense is therefore justifiable<sup>(24)</sup>.

As blending foods is more labor intense compared to the use of a commercial formula there are also additional time constraints to the family, who may already spend a significant proportion of their day caring for a child with a neurodevelopmental disorder<sup>(24)</sup>.

Useful toolkits for risk assessment prior to the start of a BD are now available<sup>(60)</sup>.

## Contraindications to the Use of a BD

Children with a known immunodeficiency or those receiving immunosuppressive medication may be at an increased risk of infection<sup>(4)</sup>. Additional care is therefore needed to ensure the family has excellent food hygiene and storage if BD is considered<sup>(28,61)</sup>.

Patients who require accurate administration of specific electrolytes may be at the risk of electrolyte imbalance and a careful risk assessment is needed to decide if BD can be started<sup>(60)</sup>.

Those with an underlying metabolic or endocrine disorder may also not be safely managed with a BD not stable in its composition.

Food allergies or a medical condition limiting the number of safe foods may limit the amount of BD that can be given without risking nutritional compromise<sup>(4)</sup>. Children with limited or reduced gastric function impacting on their ability to digest and absorb food and those who have already demonstrated an intolerance to blended foods should remain on commercialized liquid formulas<sup>(62)</sup>.

## Recommended Feeding Device

Commercial enteral formula can be given via a variety of different feeding devices including nasal, gastric and jejunal tubes, percutaneous endoscopic (PEG) or radiologically assisted gastrostomies (RIG) or gastrojejunostomies, low-profile gastrostomy, and gastrojejunostomies<sup>(63)</sup>.

Although the enteral plastic safety group does not advocate the use of BDs, it recommends that an individual risk assessment should be carried out in all patients who wish to use blended foods with an enteral feeding device, and enough information should be provided for the patient or carer to make an informed choice<sup>(64)</sup>. Some manufacturers of enteral feeding devices do support this practice when consulted if their product can be used for blended foods. Blended foods are often thicker than traditional formulas and nasogastric feeding tubes may be too narrow.

Gastrostomy tubes are hence the preferred route of choice; however, in practice, some families do use nasal tubes. Others opt to give a BD via the jejunal route<sup>(41)</sup>.

Literature informing if blending foods, even if a commercial blender is used, sufficiently breaks down proteins to allow for jejunal absorption is lacking.

There is hence insufficient evidence to support the use of BD in children requiring feeding beyond the pylorus.

Blended foods are not sterile. Bypassing the contact of food with the acidic and therefore protective gastric environment may hence be deemed unsafe.

Jejunal feeding was therefore felt to be a contraindication for BD by some<sup>(53,65,66)</sup>. Low-profile balloon/button gastrostomies which can be easily changed at home are ideally suited for use with BD. BDs are well tolerated through a 14 Fr or wider tube, but smaller tubes (eg, 12 Fr) are often used in practice<sup>(67,68)</sup>. Due to increased risk of tube blockage, a BD should not be administered through a new gastrostomy which is still healing.

Damage to the feeding device may result in unintentional dislodgement or need for early replacement.

Interruption of the healing gastrostomy could result in tract dehiscence with the potential for intraperitoneal leakage and subsequent peritonitis<sup>(69)</sup>. The tract should be well established after 12 weeks and BD can be used safely from then<sup>(28,70)</sup>.

## CONSIDERATIONS AT THE START

### Family Consultation

Before a child is started on a BD, the family, the health professional responsible for the child's overall care such as the pediatrician or general practitioner and a dietitian experienced in the use of BD should discuss the reasons why the parents would like to give blended food.

### Risk Assessment

The benefits and potential risks should be explained, and a joint decision reached, if the child will be started on BD or not<sup>(60)</sup>. The family should be informed about the equipment needed and

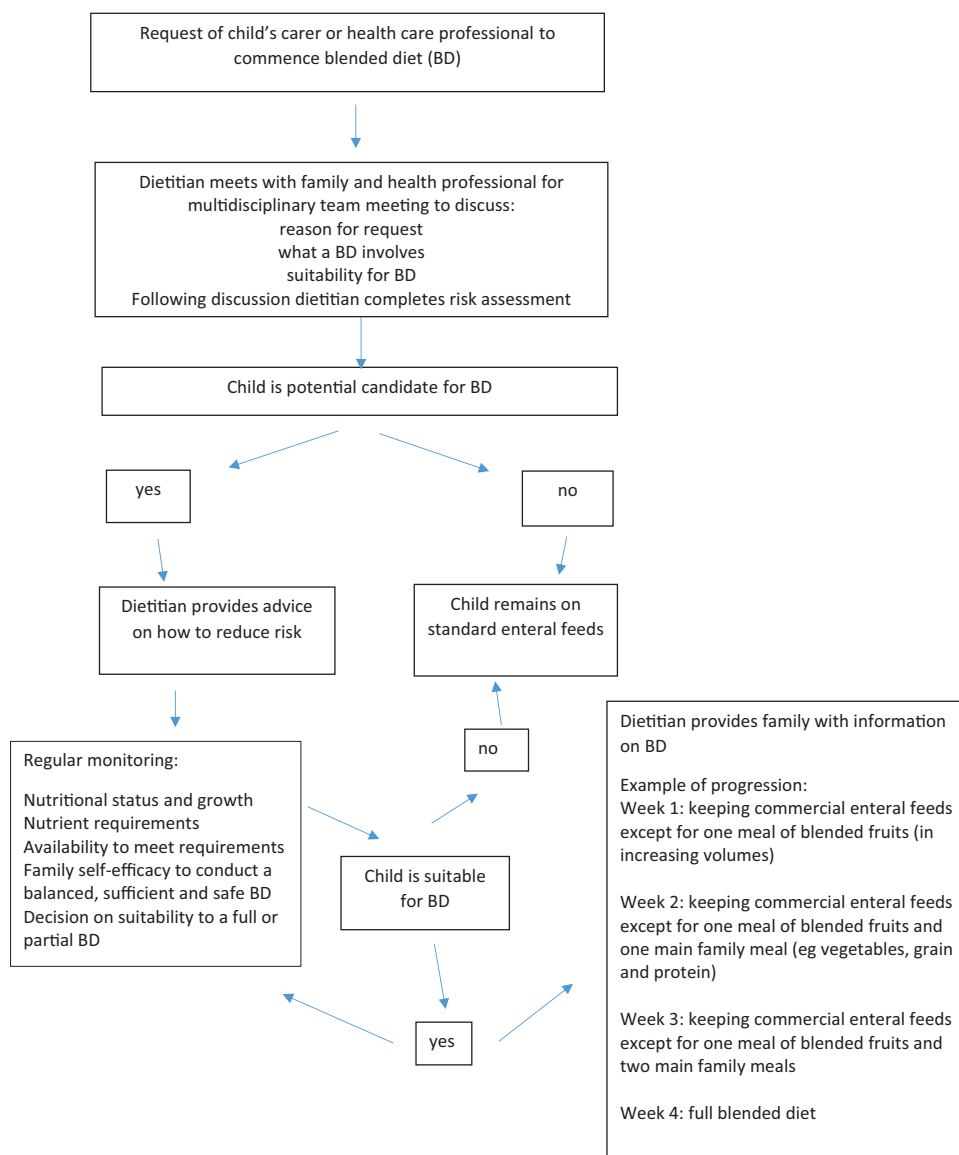


FIGURE 1. How to commence a child on a blended diet (flowchart).

work with the dietitian to understand the practicalities of giving a BD at home. A realistic plan how to establish on or transition a child to a BD should be postulated and support offered to the family throughout <sup>(1)</sup>.

As local hospital policies may vary the lead clinician should also establish if a BD can continue as an inpatient if a child requires admission unrelated to BD and agree with the family what should be done if inpatient BD was not supported.

A flowchart how to start a child on BD is outlined in Figure 1

## RECOMMENDATIONS HOW A BD SHOULD BE GIVEN

### Consistency of Blends

The consistency of blends can be graded according to the International Dysphagia Diet Standardisation Initiative (IDDSI) <sup>(71)</sup>. The IDDSI provides a framework for describing food textures and thickness of liquids. Level 0 refers to thin liquids and level 7

to regular foods. Depending on tube size blends ranging between levels 1 and 3 (thin 0, slightly thick 1, mildly thick 2 or moderately thick liquids 3) are most suitable, level 4 (pureed, extremely thick) is only suitable for larger diameter feeding devices <sup>(64)</sup>. Blended food can be given throughout the day in small quantities or as larger boluses at set times when the family is having their meals.

### Use of a Blender

The use of a blender is recommended to make sure solid particles are reduced to a smooth puree suitable for tube feeding if solid cooked or cold family foods are used <sup>(50)</sup>. While all authors deem a blender essential when home prepared blended food is used, the quality of the blender advised varies from costly professional blenders to an intermediate price range and even simple stick blenders <sup>(65,72,73)</sup>.

Some families blend every meal, others blend once a day for the whole day in advance. There are also reports of people who

blend for several days at a time in larger quantities and freeze ingredients for later use<sup>(74)</sup>.

With the help of the dietitian parents may change the way they use a BD as they become more experienced and their child gets older, for example by changing from off the shelf available baby jars to homemade blends of meals the rest of the family enjoys at the same time.

## Infusion Method

High-gravity bolus feeds can probably only be achieved with thin blends (IDDSI 0-1) as higher viscosity blends require more pressure to reach the stomach<sup>(46,58)</sup>. Thicker blends can be given with a 60-mL syringe with repetitive slow pushes in 5 to 20 mL increments, similarly to a child who is chewing and swallowing by the mouth<sup>(46)</sup>. In practice, this slow push technique is the easiest way to give blended foods into an enteral feeding device. The manufacturers of feeding pumps do not advise to deliver blended foods as enteral feeding pumps are not calibrated for this purpose and the pump's alarm may be triggered. The flow rate of BD pump feeds can be slower compared with standardized formulas<sup>(75)</sup>.

There is hence insufficient evidence to support the use of feeding pumps. In addition, children requiring continuous feeds rather than boluses are not suitable candidates for BD, as the prolonged hanging time would increase the risk of food born infections.

## When

Offering baby food jars or home cooked purees with expressed breast milk or formula can be introduced as soon as the child is old enough to start solids<sup>(51)</sup>.

Blended table food can be introduced in the same way as children progress to family foods. It is important a child can tolerate enough safe foods to make a balanced diet. Blended food should be prepared, stored and subsequently handled in line with good food hygiene standards. Avoidance of potential bacterial contamination which could cause gastrointestinal upset is key<sup>(76,77)</sup>.

## Safety and Hygiene

Blended food was found to have a higher microbial count compared to commercial enteral feeds, which are sterile while unopened. However, adherence to safe food handling in a comparison of microbial growth between a commercial formula, BD using baby food and one prepared from blending whole foods showed that all three feeding formulas were acceptable for human consumption<sup>(78)</sup>. The use of sieves for the preparation of blended foods has been found to be associated with a higher bacterial load and some advocate that sieving food should be avoided<sup>(79)</sup>. In practice, sieving food will help to separate out particles which cannot be blended easily and helps to avoid tube blockage<sup>(51)</sup>.

As long as principles of food hygiene and preparation are adhered to there should be no increased risk compared to non-blended food<sup>(60)</sup>.

Blended food should be prepared as close to its use as possible as a long time span between preparation and administration increases the risk of potential contamination.

However, there may be circumstances, for example, when children are admitted to hospital, where storage and reheating of preprepared blended food is needed.

Staff responsible for the preparation and administration of BD via gastrostomy devices should hence undertake rigorous food hygiene training<sup>(80)</sup>. Reheated food can be too hot for usage and hand temperature should not be exceeded<sup>(81)</sup>. Remixing previously blended food after warming is also recommended to avoid lumpy particles, which increase tube blockage. Blended food taken from the fridge without heating should be removed 20 minutes prior to administration to reach room temperature<sup>(81)</sup>.

## Novel Commercial Products

Commercial feeds containing food-derived ingredients have become available in recent years and may be a suitable alternative to blending family foods as long as the foods used are not contraindicated.

Their stable nutrient content and easy application can make them a suitable first choice when children are transitioned from a standard formula to a BD<sup>(82)</sup>.

An acceptability and tolerance study in children showed that one of these formulas was well tolerated by most participants and resulted in an improvement of GI symptoms and stooling, but larger studies are needed, and most parents would not consider them as BD<sup>(83)</sup>.

## Monitoring and Follow-up

There is consensus that children receiving a BD benefit from dietetic follow-up<sup>(4,51,60)</sup>. However, clear recommendations regarding the frequencies of such reviews are lacking.

During the start on blended foods or transition from standard formula to BD regular reviews ensure that appropriate amount of nutrition is given, and the family is receiving adequate support when facing difficulties.

Once a child is established on a BD follow-up should not be required more frequently than in children who are on commercially available tube feeds<sup>(60)</sup>.

A 6–12 monthly meeting with the dietitian seems a reasonable approach in those established and thriving on a blended<sup>(84)</sup>.

Every child should also have a named clinician (pediatrician or GP) responsible for the overall clinical management<sup>(85)</sup>. He/she is needed to formulate an appropriate emergency plan when a tube becomes blocked and should advise if medication requires monitoring of levels or dosing adjustment.

## Need for Future Research

Large multicenter trials are needed to compare the benefits and risks of a BD to commercially available tube feeds<sup>(86)</sup>. These should include patients and public involvement in keeping with modern research standards<sup>(87,88)</sup>.

Further research investigating the nutrient content of blended foods is needed to inform about the optimal food components which should be included and if additional vitamin and mineral supplements are advisable. A better understanding of the bacterial load of pre prepared blended feeds is needed to inform about hanging times in pump fed children and those dependant on postpyloric feeding.

A summary of the recommended practice points with strength of recommendation (SoR) and level of evidence (LoE) made by the joint CAHP and CON ESPGHAN expert group on BD is found in Table 1.

## CONCLUSIONS

The use of sterile, nutritionally complete commercially available feeds is considered the gold standard of feeding patients requiring enteral nutrition. Despite this, there is growing interest in the use of BDs given via enteral feeding tubes as an alternative mode of feeding.

Reported benefits from changing to the use of blended feeds include reduced vomiting, retching and GERD, improved bowel function, reduced dependence on medication, and improved skin, nail and hair condition, general wellbeing and mood.

Parents experience a greater sense of normality and demedicalization of their child's feeding. However, robust research is lacking. The ESPGHAN joint CAHP and CON do recommend that a BD can be used as a safe alternative or adjunct to commercially

TABLE 1. Summary of recommended practice points with SoR and LoE

Recommended practice points	LoE	SoR
<b>Start</b>		
BD can be given to children who are old enough to start weaning foods—usually from 6 mo of age	High	Strong
Weaning via tube can be done in a similar way to moving an infant from breast or bottle feeding to solid food	High	Strong
<b>Monitoring</b>		
A dietetic risk assessment is essential at the start of BD	High	Strong
Children starting new foods should be monitored for allergies and intolerances	High	Strong
Children who are started on a BD should be regularly reviewed by a dietitian and have a named clinician overseeing the child's care	High	Strong
Some medications (eg, for seizures) may be affected by the switch from formula to BD and the physician overseeing the child's care should be consulted to see if the dose should be changed or levels monitored during the transition to blended foods	Low	Weak
<b>How</b>		
Foods should be liquidized to a smooth consistency (IDDSI 1–3; IDDSI 4 for larger diameter tubes only, thinner blends should be used for small bore tubes)	Moderate	Strong
Rigorous food hygiene standards should be applied when preparing blended foods	High	Strong
Using a high-quality blender reduces the risk of tube blockage as well as the use of a sieve when the families are still learning how to prepare blends	Moderate	Strong
Data on the maximum amount of time blended foods can be given after preparation or removal from the fridge are lacking. Two hours at room temperature appears most commonly used and safe	Moderate	Weak
A meal can be blended and offered after it is cooked, for example, a proportion of a family meal, a batch cooked and individually frozen portion can be thawed and offered or an entire day's worth of food blended at the beginning of the day, stored in the fridge and given throughout the day at room temperature	Moderate	Weak
Commercially available feeds containing food-derived ingredients may be a suitable choice to start BD in children who are being transitioned from commercially prepared enteral feeds when health care settings do not support the use of home blended foods as long as all ingredients are tolerated by the child, but recommendations about their efficacy can currently not be made	Low	Weak
<b>Devices: tubes and methods</b>		
Low-profile balloon/button gastrostomies can be easily changed at home and are hence most suitable for BD	Low	Weak
The risk of tube blockage is small if feeding tubes of at least 14 Fr are used	Low	Weak
There is insufficient evidence to support the use of BD in children requiring feeding beyond the pylorus. Extreme caution is advised if considering the use of BD for jejunal feeding	Low	Strong
The easiest way to give blended foods into an enteral feeding device is with a 60-mL syringe as bolus feeds using a slow push technique	Moderate	Weak

(Continued)

TABLE 1. (Continued)

Recommended practice points	LoE	SoR
Although not recommended by the manufacturers, BD are given via pump. Most pumps will alarm frequently as they do not accept fluids above a certain viscosity and may have to be reset. Therefore, the use of BD with pump feeds may be difficult	Moderate	Strong
<b>Volume</b>		
In bolus fed children the amount of volume given as formula should be tolerated as blended food and the same bolus size can be chosen when starting BD	Moderate	Weak
Children who were fed continuous formula feeds via pump are likely to have small gastric capacity initially and only small amounts of blended food should be given at the start of a BD	Moderate	Strong
The amount of blended food should be slowly increased and enteral formula reduced according to tolerance	High	Strong

BD = blended diet, LoE = level of evidence, SoR = strength of recommendation.

available ready-to-use liquid formulas or powdered preparations made up with water in children who have undergone a careful risk assessment and have regular follow-up by a pediatric dietitian and health professional familiar with the care of children. This document provides guidance for healthcare professionals involved in the care of children considered for or already established on BDs.

The ESGPHAN joint CAHP and CON do consider BDs to be a useful addition to the feeding options in the nutritional management of children.

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